

## **DETAILED ACTION**

### ***Status of the Claims***

Claims 1-8 and 13-20 are pending wherein claims 1-8 and 13-20 are amended and claims 9-12 are canceled.

### ***Status of Previous Rejections***

The previous rejection of claims 1-8 and 13-20 under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement is withdrawn in view of the Applicant's arguments. The previous rejection of claims 1-8 and 13-20 under 35 U.S.C. 112, first paragraph, because the specification does not reasonably provide enablement for the entire scope associated with "a yield strength of 815 MPa or more" or "a yield strength of the steel after cooling by quenching or air cooling in a final treatment after final heating at a temperature of the  $Ac_3$  point or more is not less than 815 MPa" is withdrawn in view of the Applicant's arguments. The previous rejection of claims 1-8 and 13-20 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention is withdrawn in view of the Applicant's amendments to claims 1-8 and 13-20.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 5-8 and 17-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oka et al. (JP 11-310823).

In regards to claims 7-8, Oka et al. (JP '823) discloses a martensitic stainless steel having a composition relative to that of the instant invention as shown below (abstract and [0005]).

Element	Instant Claims (mass percent)	Oka et al. (JP '823) (weight percent)	Overlap
C	0.02 – 0.09	0.10 – 0.18	-
Si	0.05 – 1.0	0 – 0.5	0.05 – 0.5
Mn	0.05 – 0.95	0.1 – 1.5	0.1 – 0.95
P	0 – 0.03	0 – 0.02	0 – 0.02
S	0 – 0.01	0 – 0.01	0 – 0.01
Cr	9 – 15	12 – 14	12 – 14
Ni	1.0 – 4.5	1 – 3	1 – 3
Al	0 – 0.05	0 – 0.30	0 – 0.05
N	0 – 0.1	0.001 – 0.08	0.001 – 0.08
Cu	0.05 – 5	0 – 1.5	0.05 – 1.5
Mo	0.05 – 5	0 – 0.5	0.05 – 0.5
Ti	0.005 – 0.5	0.001 – 0.05	0.005 – 0.05
Ca	0.0003 – 0.005	0.001 – 0.01	0.001 – 0.005
Fe	Balance	Balance	Balance

The Examiner notes that the amounts of silicon, manganese, phosphorus, sulfur, chromium, nickel, aluminum, nitrogen, copper, molybdenum, titanium and calcium of the martensitic stainless steel alloy disclosed by Oka et al. (JP '823) overlaps the composition of the instant invention, which is *prima facie* evidence of obviousness. MPEP 2144.05 I. It would have been obvious to one of ordinary skill in the art at the time the invention was made to select the claimed compositions from the compositions

disclosed by Oka et al. (JP '823) because Oka et al. (JP '823) discloses the same utility (martensitic stainless steel alloy) throughout the disclosed ranges.

With respect to the amended range of carbon being "C:0.02 – 0.09%", the Examiner notes that although Oka et al. (JP '823) discloses 0.10 to 0.18 weight percent carbon, 0.09 weight percent would be close enough to 0.10 weight percent to establish prima facie evidence of obviousness. MPEP 2144.05 I.

With respect to the hardness range of 30 – 45 HRC and "the amount of carbides in grain boundaries of the prior austenite is not more than 0.13 volume %." in claims 7-8, the Examiner notes that Oka et al. (JP '823) discloses a substantially similar composition in addition to hot rolling at the  $Ac_3$ , followed by cooling at a rate at least equal to air velocity, followed by tempering at a temperature not higher than the  $Ac_1$  point. Therefore, a hardness in the range of 30 – 45 HRC and "the amount of carbides in grain boundaries of the prior austenite is not more than 0.13 volume % would be expected due to a substantially similar composition and process. MPEP 2112.01 I.

With respect to the formula  $0.2\% \leq Mo + Cu/4 \leq 5\%$  in claim 7 and  $0.55\% \leq Mo + Cu/4 \leq 5\%$  in claim 8, it is well settled that there is no invention in the discovery of a general formula if it covers a composition described in the prior art, In re Cooper and Foley 1943 C.D. 357, 553 O.G. 177; 57 USPQ 117, Saklatwalla v. Marburg, 620 O.G. 685, 1949 C.D. 77, and In re Pilling, 403 O.G. 513, 44 F(2) 878, 1931 C.D. 75. In absence of evidence to the contrary, the selection of the proportions of elements would appear to require no more than routine investigation by those of ordinary skill in the art. In re Austin, et al., 149 USPQ 685, 688. It would have been obvious to one of ordinary

skill in the art to select the desired amounts of copper and molybdenum from the ranges disclosed by Oka et al. (JP '823) such that the formula would be satisfied because Oka et al. (JP '823) discloses the same utility throughout the disclosed ranges.

With respect to the presence of impurities in line 7 of claims 7-8, Oka et al. (JP '823) discloses the presence of impurities (abstract).

With respect to the added recitation “a yield strength of the steel after cooling by quenching or air cooling in a final heat treatment after final heating at a temperature of the  $Ac_3$  point or more is not less than 815 MPa” , Oka et al. (JP '823) teaches heating up to a temperature between  $Ac_1$  and the  $Ac_3$  point and then tempering at a temperature not higher than the  $Ac_1$  point (abstract and [0007-0008]) and a yield strength that exceeds 650 MPa [0026]. Therefore, Oka et al. (JP '823) meets the claim.

In regards to claims 19-20, Oka et al. (JP '823) discloses a martensitic stainless steel having a composition relative to that of the instant invention as shown below (abstract and [0005]).

Element	Instant Claims (mass percent)	Oka et al. (JP '823) (weight percent)	Overlap
C	0.02 – 0.09	0.10 – 0.18	-
Si	0.05 – 1.0	0 – 0.5	0.05 – 0.5
Mn	0.05 – 0.95	0.1 – 1.5	0.1 – 0.95
P	0 – 0.03	0 – 0.02	0 – 0.02
S	0 – 0.01	0 – 0.01	0 – 0.01
Cr	9 – 15	12 – 14	12 – 14
Ni	1.0 – 4.5	1 – 3	1 – 3
Al	0 – 0.05	0 – 0.30	0 – 0.05
N	0 – 0.1	0.001 – 0.08	0.001 – 0.08
Cu	0.05 – 5	0 – 1.5	0.05 – 1.5
Mo	0.05 – 5	0 – 0.5	0.05 – 0.5

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Element	Instant Claims (mass percent)	Oka et al. (JP '823) (weight percent)	Overlap
Ti	0.005 – 0.5	0.001 – 0.05	0.005 – 0.05
Ca	0.0003 – 0.005	0.001 – 0.01	0.001 – 0.005
Fe	Balance	Balance	Balance

The Examiner notes that the amounts of carbon, silicon, manganese, phosphorus, sulfur, chromium, nickel, aluminum, nitrogen, copper, molybdenum, titanium and calcium of the martensitic stainless steel alloy disclosed by Oka et al. (JP '823) overlaps the composition of the instant invention, which is *prima facie* evidence of obviousness. MPEP 2144.05 I. It would have been obvious to one of ordinary skill in the art at the time the invention was made to select the claimed compositions from the compositions disclosed by Oka et al. (JP '823) because Oka et al. (JP '823) discloses the same utility (martensitic stainless steel alloy) throughout the disclosed ranges.

With respect to the amended range of carbon being "C:0.02 – 0.09%", the Examiner notes that although Oka et al. (JP '823) discloses 0.10 to 0.18 weight percent carbon, 0.09 weight percent would be close enough to 0.10 weight percent to establish *prima facie* evidence of obviousness. MPEP 2144.05 I.

With respect to the hardness range of 30 – 45 HRC and "the amount of carbides in grain boundaries of the prior austenite is not more than 0.13 volume %." in claims 19-20, the Examiner notes that Oka et al. (JP '823) discloses a substantially similar composition in addition to hot rolling at the  $Ac_3$ , followed by cooling at a rate at least equal to air velocity, followed by tempering at a temperature not higher than the  $Ac_1$  point. Therefore, a hardness in the range of 30 – 45 HRC and "the amount of carbides

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in grain boundaries of the prior austenite is not more than 0.13 volume % would be expected due to a substantially similar composition and process. MPEP 2112.01 I.

With respect to the formula  $0.2\% \leq \text{Mo} + \text{Cu}/4 \leq 5\%$  in claim 19 and  $0.55\% \leq \text{Mo} + \text{Cu}/4 \leq 5\%$  in claim 20, it is well settled that there is no invention in the discovery of a general formula if it covers a composition described in the prior art, *In re Cooper and Foley* 1943 C.D. 357, 553 O.G. 177; 57 USPQ 117, *Saklatwalla v. Marburg*, 620 O.G. 685, 1949 C.D. 77, and *In re Pilling*, 403 O.G. 513, 44 F(2) 878, 1931 C.D. 75. In absence of evidence to the contrary, the selection of the proportions of elements would appear to require no more than routine investigation by those of ordinary skill in the art. *In re Austin, et al.*, 149 USPQ 685, 688. It would have been obvious to one of ordinary skill in the art to select the desired amounts of copper and molybdenum from the ranges disclosed by Oka et al. ('520) such that the formula would be satisfied because Oka et al. (JP '823) discloses the same utility throughout the disclosed ranges.

With respect to the presence of impurities in line 7 of claims 19-20, Oka et al. (JP '823) discloses the presence of presence of impurities (abstract).

With respect to the recitation "the martensitic stainless steel having a structure resulting from one of quenching, air cooling, quenching followed by a 400°C or lower tempering treatment, or air cooling followed by a 400°C or lower tempering treatment" in claims 19-20 et al. (JP '823) discloses to hot rolling at the  $Ac_3$ , followed by cooling at a rate at least equal to air velocity, followed by tempering at a temperature not higher than the  $Ac_1$  point.. Therefore, the same or a substantially similar structure would be expected.

With respect to the recitation “and the amounts of Cu and Mo effective to form a sulfide layer on a formed chromium oxide layer” in claims 19-20, the Examiner asserts that Oka et al. (JP ‘823) discloses amounts of copper and molybdenum effective to form this sulfide layer because Oka et al. (JP ‘823) discloses a substantially similar composition. MPEP 2112.01 I.

With respect to the recitation “the sulfide layer formed as a result of the martensitic stainless steel being subjected to a sulfur-containing environment” in claims 19-20, Oka et al. (JP ‘823) discloses a substantially similar composition. Therefore, formation of the sulfide layer would be expected when subjecting the alloy to a sulfur-containing environment. MPEP 2112.01 I.

With respect to the added recitation “a yield strength of the steel after cooling by quenching or air cooling in a final heat treatment after final heating at a temperature of the  $Ac_3$  point or more is not less than 815 MPa” in claims 19-20, Oka et al. (JP ‘823) teaches heating up to a temperature between  $Ac_1$  and the  $Ac_3$  point and then tempering at a temperature not higher than the  $Ac_1$  point (abstract and [0007-0008]) and a yield strength that exceeds 650 MPa [0026]. Therefore, Oka et al. (JP ‘823) meets the claim.

In regards to claims 5-6, Oka et al. (JP ‘823) discloses a martensitic stainless steel having a composition relative to that of the instant invention as shown in the table on the following page (abstract and [0005]).

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Element	Instant Claims (mass percent)	Oka et al. (JP '823) (weight percent)	Overlap
C	0.02 – 0.09	0.10 – 0.18	-
Si	0.05 – 1.0	0 – 0.5	0.05 – 0.5
Mn	0.05 – 0.95	0.1 – 1.5	0.1 – 0.95
P	0 – 0.03	0 – 0.02	0 – 0.02
S	0 – 0.01	0 – 0.01	0 – 0.01
Cr	9 – 15	12 – 14	12 – 14
Ni	1.0 – 4.5	1 – 3	1 – 3
Al	0 – 0.05	0 – 0.30	0 – 0.05
N	0 – 0.1	0.001 – 0.08	0.001 – 0.08
Cu	0.05 – 5	0 – 1.5	0.05 – 1.5
Mo	0.05 – 5	0 – 0.5	0.05 – 0.5
Ti	-	0.001 – 0.05	-
Ca	0.0003 – 0.005	0.001 – 0.01	0.001 – 0.005
Fe	Balance	Balance	Balance

The Examiner notes that the amounts of silicon, manganese, phosphorus, sulfur, chromium, nickel, aluminum, nitrogen, copper, molybdenum, and calcium of the martensitic stainless steel alloy disclosed by Oka et al. (JP '823) overlaps the composition of the instant invention, which is *prima facie* evidence of obviousness. MPEP 2144.05 I. It would have been obvious to one of ordinary skill in the art at the time the invention was made to select the claimed compositions from the compositions disclosed by Oka et al. (JP '823) because Oka et al. (JP '823) discloses the same utility (martensitic stainless steel alloy) throughout the disclosed ranges.

With respect to the amended range of carbon being “C:0.02 – 0.09%”, the Examiner notes that although Oka et al. (JP '823) discloses 0.10 to 0.18 weight percent carbon, 0.09 weight percent would be close enough to 0.10 weight percent to establish *prima facie* evidence of obviousness. MPEP 2144.05 I.

With respect to the “consisting of” transitional language in line 1 of claims 5-6 and

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the titanium content in Oka et al. (JP '823), the Examiner notes that Oka et al. (JP '823) discloses that titanium prevents hot working degradation due to sulfur [0020]. Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to omit titanium where prevention of degradation due to sulfur would not be required or desired. MPEP 2144.04 II. Alternatively, the Examiner notes that Oka et al. (JP '823) discloses that calcium also prevents hot working degradation due to sulfur [0021]. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to substitute calcium for titanium within the disclosed range of 0.001 to 0.01 weight percent in order to achieve equivalent prevention of degradation due to sulfur absent the titanium. MPEP 2144.06.

With respect to the hardness range of 30 – 45 HRC and “the amount of carbides in grain boundaries of the prior austenite is not more than 0.13 volume %.” in claims 5-6, the Examiner notes that Oka et al. (JP '823) discloses a substantially similar composition in addition to hot rolling at the  $Ac_3$ , followed by cooling at a rate at least equal to air velocity, followed by tempering at a temperature not higher than the  $Ac_1$  point. Therefore, a hardness in the range of 30 – 45 HRC and “the amount of carbides in grain boundaries of the prior austenite is not more than 0.13 volume % would be expected due to a substantially similar composition and process. MPEP 2112.01 I.

With respect to the formula  $0.2\% \leq Mo + Cu/4 \leq 5\%$  in claim 5 and  $0.55\% \leq Mo + Cu/4 \leq 5\%$  in claim 6, it is well settled that there is no invention in the discovery of a general formula if it covers a composition described in the prior art, In re Cooper and

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Foley 1943 C.D. 357, 553 O.G. 177; 57 USPQ 117, Saklatwalla v. Marburg, 620 O.G. 685, 1949 C.D. 77, and In re Pilling, 403 O.G. 513, 44 F(2) 878, 1931 C.D. 75. In absence of evidence to the contrary, the selection of the proportions of elements would appear to require no more than routine investigation by those of ordinary skill in the art. In re Austin, et al., 149 USPQ 685, 688. It would have been obvious to one of ordinary skill in the art to select the desired amounts of copper and molybdenum from the ranges disclosed by Oka et al. (JP '823) such that the formula would be satisfied because Oka et al. (JP '823) discloses the same utility throughout the disclosed ranges.

With respect to the presence of impurities in line 7 of claim 7 and line 6 of claim 8, Oka et al. (JP '823) discloses the presence of impurities (abstract).

With respect to the added recitation "and a yield strength of the steel after cooling by quenching or air cooling in a final heat treatment after final heating at a temperature of the  $Ac_3$  point or more is not less than 815 MPa, wherein the final heating includes hot working in case that a reheating to a temperature of  $Ac_3$  point or more and subsequent cooling is not conducted" in claims 5-6, Oka et al. (JP '823) teaches heating up to a temperature between  $Ac_1$  and the  $Ac_3$  point and then tempering at a temperature not higher than the  $Ac_1$  point (abstract and [0007-0008]) and a yield strength that exceeds 650 MPa [0026]. Therefore, Oka et al. (JP '823) meets the claim.

In regards to claims 17-18, Oka et al. (JP '823) discloses a martensitic stainless steel having a composition relative to that of the instant invention as shown on the following page (abstract and [0005]).

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Element	Instant Claims (mass percent)	Oka et al. (JP '823) (weight percent)	Overlap
C	0.02 – 0.09	0.10 – 0.18	-
Si	0.05 – 1.0	0 – 0.5	0.05 – 0.5
Mn	0.05 – 0.95	0.1 – 1.5	0.1 – 0.95
P	0 – 0.03	0 – 0.02	0 – 0.02
S	0 – 0.01	0 – 0.01	0 – 0.01
Cr	9 – 15	12 – 14	12 – 14
Ni	1.0 – 4.5	1 – 3	1 – 3
Al	0 – 0.05	0 – 0.30	0 – 0.05
N	0 – 0.1	0.001 – 0.08	0.001 – 0.08
Cu	0.05 – 5	0 – 1.5	0.05 – 1.5
Mo	0.05 – 5	0 – 0.5	0.05 – 0.5
Ti	-	0.001 – 0.05	-
Ca	0.0003 – 0.005	0.001 – 0.01	0.001 – 0.005
Fe	Balance	Balance	Balance

The Examiner notes that the amounts of silicon, manganese, phosphorus, sulfur, chromium, nickel, aluminum, nitrogen, copper, molybdenum, and calcium of the martensitic stainless steel alloy disclosed by Oka et al. (JP '823) overlaps the composition of the instant invention, which is *prima facie* evidence of obviousness. MPEP 2144.05 I. It would have been obvious to one of ordinary skill in the art at the time the invention was made to select the claimed compositions from the compositions disclosed by Oka et al. (JP '823) because Oka et al. (JP '823) discloses the same utility (martensitic stainless steel alloy) throughout the disclosed ranges.

With respect to the amended range of carbon being “C:0.02 – 0.09%”, the Examiner notes that although Oka et al. (JP '823) discloses 0.10 to 0.18 weight percent carbon, 0.09 weight percent would be close enough to 0.10 weight percent to establish *prima facie* evidence of obviousness. MPEP 2144.05 I.

With respect to the hardness range of 30 – 45 HRC and “the amount of carbides in grain boundaries of the prior austenite is not more than 0.13 volume %.” in claims 17-18, the Examiner notes that Oka et al. (JP ‘823) discloses a substantially similar composition in addition to hot rolling at the  $Ac_3$ , followed by cooling at a rate at least equal to air velocity, followed by tempering at a temperature not higher than the  $Ac_1$  point. Therefore, a hardness in the range of 30 – 45 HRC and “the amount of carbides in grain boundaries of the prior austenite is not more than 0.13 volume % would be expected due to a substantially similar composition and process. MPEP 2112.01 I.

With respect to the formula  $0.2\% \leq Mo + Cu/4 \leq 5\%$  in claim 17 and  $0.55\% \leq Mo + Cu/4 \leq 5\%$  in claim 18, it is well settled that there is no invention in the discovery of a general formula if it covers a composition described in the prior art, In re Cooper and Foley 1943 C.D. 357, 553 O.G. 177; 57 USPQ 117, Saklatwalla v. Marburg, 620 O.G. 685, 1949 C.D. 77, and In re Pilling, 403 O.G. 513, 44 F(2) 878, 1931 C.D. 75. In absence of evidence to the contrary, the selection of the proportions of elements would appear to require no more than routine investigation by those of ordinary skill in the art. In re Austin, et al., 149 USPQ 685, 688. It would have been obvious to one of ordinary skill in the art to select the desired amounts of copper and molybdenum from the ranges disclosed by Oka et al. (‘520) such that the formula would be satisfied because Oka et al. (JP ‘823) discloses the same utility throughout the disclosed ranges.

With respect to the presence of impurities in line 6 of claims 17-18, Oka et al. (JP ‘823) discloses the presence of presence of impurities (abstract).

With respect to the “consisting of” transitional language in line 2 of claims 17-18

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and the titanium content in Oka et al. (JP '823), the Examiner notes that Oka et al. (JP '823) discloses that titanium prevents hot working degradation due to sulfur [0020].

Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to omit titanium where prevention of degradation due to sulfur would not be required or desired. MPEP 2144.04 II. Alternatively, the Examiner notes that Oka et al. (JP '823) discloses that calcium also prevents hot working degradation due to sulfur [0021]. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to substitute calcium for titanium within the disclosed range of 0.001 to 0.01 weight percent in order to achieve equivalent prevention of degradation due to sulfur absent the titanium. MPEP 2144.06.

With respect to the recitation "the martensitic stainless steel having a structure resulting from one of quenching, air cooling, quenching followed by a 400°C or lower tempering treatment, or air cooling followed by a 400°C or lower tempering treatment" in claims 17-18 et al. (JP '823) discloses to hot rolling at the  $Ac_3$ , followed by cooling at a rate at least equal to air velocity, followed by tempering at a temperature not higher than the  $Ac_1$  point.. Therefore, the same or a substantially similar structure would be expected.

With respect to the recitation "and the amounts of Cu and Mo effective to form a sulfide layer on a formed chromium oxide layer" in claims 17-18, the Examiner asserts that Oka et al. (JP '823) discloses amounts of copper and molybdenum effective to form this sulfide layer because Oka et al. (JP '823) discloses a substantially similar composition. MPEP 2112.01 I.

With respect to the recitation "the sulfide layer formed as a result of the martensitic stainless steel being subjected to a sulfur-containing environment" in claims 17-18, Oka et al. (JP '823) discloses a substantially similar composition. Therefore, formation of the sulfide layer would be expected when subjecting the alloy to a sulfur-containing environment. MPEP 2112.01 I.

With respect to the added recitation "and a yield strength of the steel after cooling by quenching or air cooling in a final heat treatment after final heating at a temperature of the  $Ac_3$  point or more is not less than 815 MPa," in claims 17-18, Oka et al. (JP '823) teaches heating up to a temperature between  $Ac_1$  and the  $Ac_3$  point and then tempering at a temperature not higher than the  $Ac_1$  point (abstract and [0007-0008]) and a yield strength that exceeds 650 MPa [0026]. Therefore, Oka et al. (JP '823) meets the claim.

### ***Allowable Subject Matter***

Claims 1-4 and 13-16 are allowed.

The following is a statement of reasons for the indication of allowable subject matter:

In regards to claim 1, the prior art does not disclose or adequately suggest a martensitic stainless steel consisting of 0.02 to 0.09 mass percent carbon, 0.05 to 1 mass percent silicon, 0.05 to 0.95 mass percent manganese, not more than 0.03 mass percent phosphorus, not more than 0.01 mass percent sulfur, 9 to 15 mass percent chromium, 1.0 to 4.5 mass percent nickel, not more than 0.05 mass percent aluminum,

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not more than 0.1 mass percent nitrogen, 0.05 to 5 mass percent copper and 0.05 to 5 mass percent molybdenum wherein the content of copper and molybdenum satisfy the formula,  $0.2\% \leq \text{Mo} + \text{Cu}/4 \leq 5\%$ , and wherein the hardness is 30 to 45 HRC and the amount of carbides in grain boundaries of prior austenite is not more than 0.13 volume percent and the yield strength of the steel after cooling by quenching or air cooling in a final treatment after final heating at a temperature of the  $\text{Ac}_3$  point or more is not less than 815 MPa.

In regards to claim 2, the prior art does not disclose or adequately suggest a martensitic stainless steel consisting of 0.02 to 0.09 mass percent carbon, 0.05 to 1 mass percent silicon, 0.05 to 0.95 mass percent manganese, not more than 0.03 mass percent phosphorus, not more than 0.01 mass percent sulfur, 9 to 15 mass percent chromium, 1.0 to 4.5 mass percent nickel, not more than 0.05 mass percent aluminum, not more than 0.1 mass percent nitrogen, 0.05 to 5 mass percent copper and 0.05 to 5 mass percent molybdenum wherein the content of copper and molybdenum satisfy the formula,  $0.55\% \leq \text{Mo} + \text{Cu}/4 \leq 5\%$ , and wherein the hardness is 30 to 45 HRC and the amount of carbides in grain boundaries of prior austenite is not more than 0.13 volume percent and the yield strength of the steel after cooling by quenching or air cooling in a final treatment after final heating at a temperature of the  $\text{Ac}_3$  point or more is not less than 815 MPa.

In regards to claim 3, the prior art does not disclose or adequately suggest a martensitic stainless steel consisting of 0.02 to 0.09 mass percent carbon, 0.05 to 1 mass percent silicon, 0.05 to 0.95 mass percent manganese, not more than 0.03 mass

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percent phosphorus, not more than 0.01 mass percent sulfur, 9 to 15 mass percent chromium, 1.0 to 4.5 mass percent nickel, not more than 0.05 mass percent aluminum, not more than 0.1 mass percent nitrogen, 0.05 to 5 mass percent copper, 0.05 to 5 mass percent molybdenum, and at least one of the elements of titanium at a level of 0.005 to 0.5 mass percent, vanadium 0.005 to 0.5 mass percent and niobium 0.005 to 0.5 mass percent wherein the content of copper and molybdenum satisfy the formula,  $0.2\% \leq \text{Mo} + \text{Cu}/4 \leq 5\%$ , and wherein the hardness is 30 to 45 HRC and the amount of carbides in grain boundaries of prior austenite is not more than 0.13 volume percent and the yield strength of the steel after cooling by quenching or air cooling in a final treatment after final heating at a temperature of the  $\text{Ac}_3$  point or more is not less than 815 MPa.

In regards to claim 4, the prior art does not disclose or adequately suggest a martensitic stainless steel consisting of 0.02 to 0.09 mass percent carbon, 0.05 to 1 mass percent silicon, 0.05 to 0.95 mass percent manganese, not more than 0.03 mass percent phosphorus, not more than 0.01 mass percent sulfur, 9 to 15 mass percent chromium, 1.0 to 4.5 mass percent nickel, not more than 0.05 mass percent aluminum, not more than 0.1 mass percent nitrogen, 0.05 to 5 mass percent copper, 0.05 to 5 mass percent molybdenum, and at least one of the elements of titanium at a level of 0.005 to 0.5 mass percent, vanadium 0.005 to 0.5 mass percent and niobium 0.005 to 0.5 mass percent wherein the content of copper and molybdenum satisfy the formula,  $0.55\% \leq \text{Mo} + \text{Cu}/4 \leq 5\%$ , and wherein the hardness is 30 to 45 HRC and the amount of carbides in grain boundaries of prior austenite is not more than 0.13 volume percent

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and the yield strength of the steel after cooling by quenching or air cooling in a final treatment after final heating at a temperature of the  $Ac_3$  point or more is not less than 815 MPa.

In regards to claim 13, the prior art does not disclose or adequately suggest a martensitic stainless steel consisting of 0.02 to 0.09 mass percent carbon, 0.05 to 1 mass percent silicon, 0.05 to 0.95 mass percent manganese, not more than 0.03 mass percent phosphorus, not more than 0.01 mass percent sulfur, 9 to 15 mass percent chromium, 1.0 to 4.5 mass percent nickel, not more than 0.05 mass percent aluminum, not more than 0.1 mass percent nitrogen, 0.05 to 5 mass percent copper and 0.05 to 5 mass percent molybdenum wherein the content of copper and molybdenum satisfy the formula,  $0.2\% \leq Mo + Cu/4 \leq 5\%$ , and wherein the hardness is 30 to 45 HRC and the amount of carbides in grain boundaries of prior austenite is not more than 0.13 volume percent and the yield strength of the steel after cooling by quenching or air cooling in a final treatment after final heating at a temperature of the  $Ac_3$  point or more is not less than 815 MPa and the amounts of copper and molybdenum effective to form a sulfide layer on a formed chromium oxide layer, the sulfide layer formed as a result of the martensitic stainless steel being subjected to a sulfur-containing environment.

In regards to claim 14, the prior art does not disclose or adequately suggest a martensitic stainless steel consisting of 0.02 to 0.09 mass percent carbon, 0.05 to 1 mass percent silicon, 0.05 to 0.95 mass percent manganese, not more than 0.03 mass percent phosphorus, not more than 0.01 mass percent sulfur, 9 to 15 mass percent chromium, 1.0 to 4.5 mass percent nickel, not more than 0.05 mass percent aluminum,

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not more than 0.1 mass percent nitrogen, 0.05 to 5 mass percent copper and 0.05 to 5 mass percent molybdenum wherein the content of copper and molybdenum satisfy the formula,  $0.55\% \leq \text{Mo} + \text{Cu}/4 \leq 5\%$ , and wherein the hardness is 30 to 45 HRC and the amount of carbides in grain boundaries of prior austenite is not more than 0.13 volume percent and the yield strength of the steel after cooling by quenching or air cooling in a final treatment after final heating at a temperature of the  $\text{Ac}_3$  point or more is not less than 815 MPa and the amounts of copper and molybdenum effective to form a sulfide layer on a formed chromium oxide layer, the sulfide layer formed as a result of the martensitic stainless steel being subjected to a sulfur-containing environment.

In regards to claim 15, the prior art does not disclose or adequately suggest a martensitic stainless steel consisting of 0.02 to 0.09 mass percent carbon, 0.05 to 1 mass percent silicon, 0.05 to 0.95 mass percent manganese, not more than 0.03 mass percent phosphorus, not more than 0.01 mass percent sulfur, 9 to 15 mass percent chromium, 1.0 to 4.5 mass percent nickel, not more than 0.05 mass percent aluminum, not more than 0.1 mass percent nitrogen, 0.05 to 5 mass percent copper, 0.05 to 5 mass percent molybdenum, and at least one of the elements of titanium at a level of 0.005 to 0.5 mass percent, vanadium 0.005 to 0.5 mass percent and niobium 0.005 to 0.5 mass percent wherein the content of copper and molybdenum satisfy the formula,  $0.2\% \leq \text{Mo} + \text{Cu}/4 \leq 5\%$ , and wherein the hardness is 30 to 45 HRC and the amount of carbides in grain boundaries of prior austenite is not more than 0.13 volume percent and the yield strength of the steel after cooling by quenching or air cooling in a final treatment after final heating at a temperature of the  $\text{Ac}_3$  point or more is not less than

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815 MPa and the amounts of copper and molybdenum effective to form a sulfide layer on a formed chromium oxide layer, the sulfide layer formed as a result of the martensitic stainless steel being subjected to a sulfur-containing environment.

In regards to claim 16, the prior art does not disclose or adequately suggest a martensitic stainless steel consisting of 0.02 to 0.09 mass percent carbon, 0.05 to 1 mass percent silicon, 0.05 to 0.95 mass percent manganese, not more than 0.03 mass percent phosphorus, not more than 0.01 mass percent sulfur, 9 to 15 mass percent chromium, 1.0 to 4.5 mass percent nickel, not more than 0.05 mass percent aluminum, not more than 0.1 mass percent nitrogen, 0.05 to 5 mass percent copper, 0.05 to 5 mass percent molybdenum, and at least one of the elements of titanium at a level of 0.005 to 0.5 mass percent, vanadium 0.005 to 0.5 mass percent and niobium 0.005 to 0.5 mass percent wherein the content of copper and molybdenum satisfy the formula,  $0.55\% \leq \text{Mo} + \text{Cu}/4 \leq 5\%$ , and wherein the hardness is 30 to 45 HRC and the amount of carbides in grain boundaries of prior austenite is not more than 0.13 volume percent and the yield strength of the steel after cooling by quenching or air cooling in a final treatment after final heating at a temperature of the  $\text{Ac}_3$  point or more is not less than 815 MPa and the amounts of copper and molybdenum effective to form a sulfide layer on a formed chromium oxide layer, the sulfide layer formed as a result of the martensitic stainless steel being subjected to a sulfur-containing environment.

***Response to Arguments***

Applicant's arguments filed 3 October 2011 have been fully considered but they are not persuasive.

The Applicant primarily argues that a *prima facie* case obviousness was present based on Oka et al. (JP '823) based on an overlap in composition and similarly in processing that supports a position that the limitations of the claims not expressly stated in Oka et al. (JP '823) are inherent and rejection is no longer valid since an overlap in the composition no longer exists between Oka et al. (JP '823) since the upper limit is now defined as 0.09 mass percent. The Applicant further argues that Oka et al. (JP '823) teaches away from lowering the carbon content below 0.10 mass percent and the Examiner cannot say that there is no difference between an alloy that has a carbon content of 0.09 mass percent and one that has a carbon content of 0.10 mass percent.

In response, a *prima facie* case of obviousness exists where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties. MPEP 2144.05 I. Applicant's burden is to show that how one alloy having the same additives with the balance being iron with 0.09 mass percent carbon would be distinct from one alloy having the same additives with the balance being iron with 0.10 mass percent carbon.

***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jessee Roe whose telephone number is (571)272-5938. The examiner can normally be reached on Monday-Thursday and alternate Fridays 7:00 AM - 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V. King can be reached on (571) 272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/ Roy King/  
Supervisory Patent Examiner, Art  
Unit 1733

/JR/